

CLAIMS

What is claimed is:

- 5 1. An implantable device for automatically monitoring and reporting patient physical activity, the device comprising:
- at least one implantable sensor operative to provide information related to patient movement;
- a processor in communication with the at least one
- 10 implantable sensor, wherein the processor is operative to evaluate the information provided by the at least one sensor, automatically determine when the at least one sensor is indicating patient movement in excess of a threshold value, and automatically determine a maximum equivalent quantified activity during a
- 15 determined interval;
- memory in communication with the sensor to receive and store data related to the patient's movement, including the maximum equivalent quantified activity; and
- a telemetry circuit in communication with the memory and
- 20 operative to transmit internally determined data related to the patient's activity.
- 25 2. The device of Claim 1, wherein the sensor comprises an accelerometer.
- 30 3. The device of Claim 2, wherein the device double integrates an acceleration signal from the sensor to determine a final location so as to automatically determine the maximum equivalent quantified activity during the determined interval from an initial location.
4. The device of Claim 2, wherein the device double integrates an acceleration signal from the sensor to determine a distance traveled so as

to automatically determine the maximum equivalent quantified activity during the determined interval.

5 5. The device of Claim 1, wherein, when a total episode of patient movement in excess of the threshold value proceeds longer than the determined period, the device continuously evaluates the equivalent quantified activity during all time periods of the determined period within the total episode and determines the largest equivalent quantified activity during any determined period so as to determine the maximum equivalent
10 quantified activity.

 6. The device of Claim 5, wherein the time periods of the determined period evaluated during the total episode are only non-overlapping periods.

15 7. The device of Claim 1, wherein the sensor comprises a position sensor.

 8. The device of Claim 7, wherein the position sensor comprises a
20 global positioning system receiver.

 9. The device of Claim 7, wherein the device determines a distance traveled from an initial position within the determined period to determine the maximum equivalent quantified activity.

25 10. The device of Claim 1, wherein automatically determining when the at least one sensor is indicating patient movement in excess of a threshold value comprises establishing a cyclical acceleration in excess of a threshold value indicative of patient walking.

30 11. The device of Claim 1, wherein determining the maximum equivalent quantified activity during the determined period comprises determining a maximum equivalent distance walked.

12. The device of Claim 11, wherein automatically determining a maximum equivalent distance walked comprises periodically incrementing an initial distance value with a determined equivalent distance traveled during a measurement period.

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13. The device of Claim 1, wherein the determined interval is selected to correspond to a standard clinical measurement period.

14. The device of Claim 1, further comprising:

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an implantable stimulation circuit adapted to provide therapeutic electrical stimulation; and

a controller in communication with the at least one sensor and the stimulation circuit such that, upon detection of a cardiac arrhythmia as sensed by the at least one sensor, the controller can induce the stimulation circuit to internally deliver a therapeutic stimulation.

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15. A method of automatically determining indices of a patient's physical activity and reporting the same with an implantable device, the method comprising:

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internally measuring a parameter indicative of patient movement;

determining whether the measurement of patient movement exceeds a threshold indicating patient movement of sufficient intensity and duration to indicate further evaluation;

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calculating an equivalent exertion index for a determined interval;

recording at least one equivalent exertion index; and

providing the at least one equivalent exertion index to an

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external device.

16. The method of Claim 15, wherein measuring the parameter indicative of patient movement comprises measuring an acceleration.

5 17. The method of Claim 15, wherein measuring the parameter indicative of patient movement comprises measuring patient position in space with respect to time.

10 18. The method of Claim 15, wherein determining whether the measurement of patient movement exceeds the threshold indicating patient movement of sufficient intensity and duration to indicate further evaluation comprises evaluating whether the measurement of patient movement is indicative of the patient walking.

15 19. The method of Claim 15, wherein calculating an equivalent exertion index for a determined interval comprises calculating an equivalent distance walked during the determined interval.

20 20. The method of Claim 19, wherein calculating the equivalent distance walked for the determined interval comprises periodically incrementing the equivalent distance walked over the duration of the determined interval.

25 21. The method of Claim 20, wherein periodically incrementing the equivalent distance walked comprises double integrating an acceleration signal.

30 22. The method of Claim 20, wherein periodically incrementing the equivalent distance walked comprises periodically incrementing the distance by a sensed position signal.

23. The method of Claim 20, wherein periodically incrementing the equivalent distance walked comprises periodically updating velocity values to periodically calculate incremental distance walked.

24. The method of Claim 15, wherein the determined interval comprises a six minute interval.

5 25. The method of Claim 15, wherein recording at least one equivalent exertion index comprises recording the highest equivalent exertion index calculated during any determined interval within an episode of patient movement exceeding the threshold longer than the determined interval.

10 26. The method of Claim 24, wherein recording the least one equivalent exertion index comprises recording the highest equivalent exertion index calculated during any non-overlapping determined interval within the episode of patient movement exceeding the threshold longer than the determined interval.

15 27. The method of Claim 15, wherein recording at least one equivalent exertion index comprises recording the highest exertion index measured during a given period.

20 28. The method of Claim 26, wherein the given period comprises a day.

25 29. The method of Claim 15, wherein providing the at least one equivalent exertion index to an external device comprises telemetrically transmitting the recorded equivalent exertion index to a physician programmer.

30 30. A system for automatically monitoring patient physical activity and for evaluating the same, the system comprising:
an implantable device comprising:
means for sensing information related to patient movement;
processing means for evaluating information provided by the sensing means to determine when patient movement

in excess of a threshold value is indicated, the processing means further comprising means for determining a maximum equivalent quantified activity during a determined interval; and

5 data storage means in communication with the processing means for storing data related to the maximum equivalent quantified activity determined over time; an external device comprising display means for displaying information received from the implantable device; and
10 means for telemetering data between the implantable device and the external device such that the data stored in the implantable device may be selectively transmitted to the external device for display.

15 31. The system of Claim 30, wherein the sensing means comprises an accelerometer.

 32. The system of Claim 30, wherein the external device comprises a physician programmer.

20 33. The system of Claim 30, wherein the implantable device further comprises:

 implantable stimulation means adapted to selectively and internally provide therapeutic electrical stimulation; and
25 control means in communication with the sensing means and the stimulation means such that, upon detection of a cardiac arrhythmia as sensed by the sensing means, the control means can induce the stimulation means to deliver the therapeutic stimulation.

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